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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • JUNE 10, 1944

Your Bonds

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A SCIENCE SERVICE PUBLICATION

KEEPING UP WITH *Electricity*

BACK ON THE JOB after a 25-year layoff are the original Westinghouse generators at Niagara Falls. These went into service in 1895 as part of the first great a-c polyphase power system. Replaced in 1917, they were kept as standby equipment until the beginning of the present war. Rewound and reconditioned, they are now back in full-time service, delivering *more* power than when new.

LIGHTS FOR HEAVYWEIGHTS. Those new super-bombers we've been reading about brought trouble on landing fields. Contact lights, sunk in the concrete runways, weren't built to stand the weight, so structural strength had to be increased to 200,000 pounds, without any change in dimensions. As late as 1942, 35,000 pounds was standard.

SIX-ROOM TRANSFORMERS—rather transformers as large as a six-room house are now serving a new war industry. They're rated at 75,000 kva each, and require 188 tons of steel, 130 miles of copper wire. Separately-mounted radiators, and use of Hipersil for cores kept down size and weight. Otherwise, say engineers, problems of shipment and installation would have been insuperable.

"MAKE WAY FOR A SAILOR" may be the new slogan in locomotives. Steam turbines, so efficient in ship propulsion, are being adapted for railroad use. Tests of one Westinghouse experimental 6,500 hp unit indicate a saving of one-fourth in steam required, compared to conventional reciprocating engines of the same power.

INSPECTING THE INVISIBLE. Tiny pinholes, invisible to the naked eye, mean defective tin plate and possible spoilage of badly needed food. A Westinghouse photoelectric device detects these defects every time, though the tin plate rolls past at 1,000 feet a minute. Flawed sections are automatically marked, to be later cut and removed.

GEOPHYSICS

New Star Camera

Engineers, surveyors and astronomers can find their location by photographing night sky overhead simultaneously with clock face.

➤ A NEW sky camera that enables engineers, surveyors, and astronomers to determine their location, by photographing the night sky directly overhead, was reported by Lt. Julius L. Speert of the U. S. Army Air Corps, at the meeting of the American Geophysical Union in Washington, D. C.

The new camera takes a standard 4 by 5 inch plate and is set on a tripod so that it photographs a portion of the sky directly above, showing the stars in the vicinity of the zenith. Attached to this camera is another smaller camera, usually 35 millimeter size, which takes a picture of a clock at the same instant as the photograph of the stars is taken.

With this information, the sky-photographer can determine his exact location.

To simplify the problem of identifying the stars photographed, a special light box has been developed. The light box contains a glass window which is illuminated from behind. Directly back of the glass plate there is a long strip of thin film mounted on two spools. On the film is drawn a special diagram covering the full region from the equator to the pole, and to the same scale as the photographic plates.

With the star photograph, and the time it was exposed known, and the approximate longitude of the point at which the exposure was taken also known, it is possible to determine the exact latitude within one or two seconds, by placing the photograph on the glass window of the light box and moving the film into the proper position.

With these data the stars may be quickly identified by referring to any competent star map or catalogue of stars.

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Small Earthquake Recorder

➤ THE DEVELOPMENT of a new electronic amplifying device, operated by batteries, that can be used to magnify and record near and distant earthquakes was reported to the meeting by Dr. Fred Keller of New Kensington, Pa.

The new device is smaller, making it more convenient to operate and less expensive to run, since it records earth tremors on smoked paper or with ink instead of using the costlier photographic method.

The new recorder was designed for battery operation, with separate batteries for the galvanometer lamp, photo-electric cell and amplifier circuits, in order to obtain constant illumination and uniform voltages.

In operation, the earth tremors are picked up by an instrument called the seismometer and transmitted by a beam of light focused on a photo-electric cell. The photo-cell then sets up an electric circuit which causes a stylus to move, registering the data on the smoked paper.

The markings on the smoked paper depend upon the strength of the beam of light on the photo-cell.

The smoked paper chart is nearly a yard long and is coiled on a drum which is turned by clockwork, moving at the speed of more than one inch a minute. The tape is kept short for sake of compactness; however, eight recordings may be made on a single strip of tape, which is 8.5 inches wide, providing four hours of continuous recording from a single tape. However, the equipment is only operated at periods of eight or ten seconds at a time.

"Electronic amplifying and recording devices can also be used to advantage for the magnification and recording of earth motion, especially where photographic methods would not be convenient or economical," Dr. Keller concluded.

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Automatic Navigator

➤ A NEW air navigation instrument that enables a fighter plane pilot to determine his location automatically, without having to make lengthy computations, was proposed by Dr. T. A. Jaggar of the University of Hawaii, to the American Geophysical Union. The new device would be a boon to fighter pilots who are tired after long flights, or fighting the enemy in the sky, and must take

GUN-CAMERA TEAM—The nose of a P-38 airplane has been opened to show you the camera installed there by Materiel Command experts of the Army Air Forces to photograph enemy planes at the instant that they are being shot down by the guns above. This is an official photograph.

their bearings in order to return to their aircraft carrier or base.

The device consists of a mirror, a lens, and a small star map showing each star in its correct position in relation to the rest of the stars. By adjusting the mirror so that it reflects images of the actual stars in the sky onto the stars on the printed sky map, and looking through the lens, the pilot can determine his field of vision. Then by referring to a special graphic chart and to his watch, he can automatically read his exact location in latitude and longitude.

By using this new instrument, it is expected that pilots will be able to make the necessary calculation in a matter of seconds. Now it takes several minutes to perform the figuring, and an error made by a tired pilot may have serious results.

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PHYSICS

Post-War Betatron

Plans for a 250,000,000-volt machine to open new fields of research by bringing cosmic ray effects into the laboratory.

➤ PLANS for the post-war construction of a 250,000,000-volt betatron, also called the rheotron, the most powerful X-ray and atom-smashing machine ever built, which will open wholly new fields to scientific research by bringing cosmic ray effects into the laboratory, were announced by Prof. G. M. Almy of the physics department, University of Illinois.

The new betatron will be similar to the 225-ton cyclotron, another type of atom-smasher, in size, shape and method of operation. It is constructed so that a powerful magnet surrounds the doughnut-shaped accelerating chamber. One of the distinguishing features of the machine is that it whirls electrons, the lightest constituents of the atom, while the cyclotron whirls the deuterons, or heavier parts. It does this operation in one "kick," while the cyclotron requires many "kicks." In the betatron the magnetic field changes, while in the cyclotron it remains constant.

Three betatrons have already been designed by Prof. Donald W. Kerst of the University of Illinois. Two of the machines, one having an eight-inch accelerating chamber and producing 2,500,000 volts, and the other having a 20-inch accelerating chamber and producing 20,000,000 volts, are located at the University of Illinois. The third betatron, much larger than the first two, produces 100,000,000 volts and is located at the General Electric Company laboratories in Schenectady.

"The first 2,500,000-volt betatron proved the idea workable. The 20,000,000-volt betatron in its two years of operation has made several valuable contributions to the knowledge of atoms, electrons and X-rays, and has opened the possibility of its use for the deep treatment of cancer by sending the electrons directly into the body of the patient, a whole new field of high energy physics," Dr. Almy stated.

At present the 20,000,000-volt betatron is being used for research in the above fields.

Dr. Almy pointed out that increasing the energy to 250,000,000 volts opens wider the field of cosmic rays to new phenomena of the deepest significance.

It is believed that a 250,000,000-volt betatron will also provide a laboratory source of mesotrons, heavy electrons, particles of fundamental importance in studies of atomic nuclei and of, as yet, unknown practical usefulness.

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AGRICULTURE

Hillculture for Erosion

➤ COMMON WEEDS successful in checking erosion of productive cropland are regarded as more valuable than wheat or corn, it was announced by the Department of Agriculture.

At a time when obtaining a maximum yield per acre is vital to victory, the U. S. Soil Conservation Service is developing new and more effective ways to halt fissuring and cross-wash of top-soil, which have already ruined 50 million acres of American farmland.

On the Department of Agriculture's 1,700 acre experiment station at Beltsville, Md., northeast of Washington, an effort is being made to single out those strains of plants that make the best growth on poor, eroded soils, require a minimum of cultivation, and at the same time bring in the best income for the farmer. This phase of conservation is called hillculture because it is designed

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to discover safe and profitable ways of farming steep lands.

Hillculture has under way such projects as production of sumac for use in tanning fine leathers, milkweed floss as a substitute for imported Java kapok, and Devil's shoestring roots for the manufacture of insecticides. Remarkable progress has been made in improving the raising of tobacco on sloping land.

One of the outstanding achievements of hillculture has been in developing the shipmast locust for use as posts, a great improvement over the abundant crooked-trunk black-locust stock.

A nursery is maintained at Beltsville. It is used to increase the growth of superior erosion-resistant plants. Many native and exotic species and varieties are under study and propagation.

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METEOROLOGY

To Measure Cloud Ceiling

Balloon methods replaced by air-cooled mercury vapor lamp and a photoelectric unit. Light projected vertically is reflected by clouds.

▶ THE U. S. Weather Bureau has begun installations of a new photoelectric instrument, called the ceilometer, for measuring the cloud ceiling at airports. The CAA has also announced its approval of the ceilometer after exhaustive tests at the National Airport in Washington, D. C.

Up to the present time, information concerning ceiling heights has been obtained by balloon methods, which were not satisfactory. The new ceilometer, developed by Laurence W. Foskett and B. L. Hansen of the instrument division of the U. S. Weather Bureau, provides a dependable means of obtaining cloud ceiling heights which are vital to the safe arrival and departure of aircraft at an airport.

The equipment consists of an air-cooled mercury vapor lamp of 30,000,000 to 40,000,000 candlepower, and a photoelectric unit, the ceilometer. The mercury vapor lamp projector directs vertically an intense beam of light which forms a spot on the base of a cloud. This spot of light is detected by the ceilometer, and the angular elevation of the spot, and thus of the cloud base, is noted. An automatic facsimile recorder connected to the ceilometer gives the airport meteorologist a constant check on the cloud ceiling height. This information is transmitted to pilots of incoming and outgoing planes.

"The ceilometer can be used in bright daylight or at night, and under all types of weather conditions," Mr. Foskett said.

The cost of a complete installation is about $3,500. It is expected that a nation-wide network of ceilometer installations will be in operation within a year or two.

Carrying on work begun by the CAA, another new instrument has been developed by the U. S. Weather Bureau in cooperation with the National Bureau of Standards and the Navy Department. This instrument, called the transmissometer, gives an automatic record of visibility by measuring the transmission of light through the atmosphere. Like the ceilometer it uses a powerful light projector and a photoelectric unit. The projector and photoelectric unit are set on the ground, about 2,700 feet apart, with the beam of light focused on the photo-cell. A recorder indicates the percentage of light transmitted which reaches the photo-cell, and by an automatic mathematical calculation the meteorologist is able to determine the visibility.

Both of these new devices are expected to be of valuable aid to post-war flying, enabling airports to have a minute-to-minute record of both cloud ceiling and visibility.

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ENGINEERING

Portable Fog Generators Can Blank Out Entire City

▶ NEWEST DEVICE for the protection of our troops as they storm the bastions of Fortress Europe, the midget M2 fog generator, was given its first public showing by the Chemical Warfare Service at an Army exhibition of weapons and equipment in Washington, D. C.

This fog generator is a compact, highly portable, trimmed-down but more efficient version of the M1 device that has done great service in North Africa, Sicily and Italy. Wholly automatic in operation, it uses the same materials and produces the same kind of concealing white cloud. Under proper atmospheric conditions, a CWS company equipped with 48 M2's could fog out a whole city.

***CHECKS CEILING** — Airplane pilots can have continuous information about the height of the clouds by means of this instrument, the ceilometer, shown here with Laurence W. Foskett, of the U. S. Weather Bureau, one of the inventors.*

Big advance in the M2 generator is in its compactness and portability. It is only one-twentieth as bulky as the M1. Its dimensions are hardly those of a small steamer trunk; it is light enough to be carried on the back of a jeep. Four husky men can pick it up and carry it over rough ground or up rocky slopes. It can be hidden behind a low bush or set down in a fox-hole.

This does not mean that the M1 fog generator is headed for the scrap-pile. This big machine, looking a good deal like an old-fashioned circus steam calliope, will still function around permanent large installations that need concealment from enemy planes, such as airfields, seaports and railroad yards. The M2 will take over in the fighting zone, where high mobility and inconspicuousness as a target are at a premium.

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ORDNANCE

More Giant Guns

Army's 240 millimeter howitzer and eight-inch rifle which can be easily transported, will play big role in coming battles.

➤ LOUDER and deeper big-gun voices are to be added to the quarrel at Europe's disputed barricades, it has been made plain by the new Army orders for eight- and ten-fold increases in production of heavy ammunition, and for speeding up the making of the powerful barrels that will hurl them at Nazi fortifications.

In particular, the most powerful pleaders for a peaceful world that will roll over Europe's roads in the hot months ahead are the Army's 240 millimeter howitzer and eight-inch rifle. They are the bigger brothers of the two heavy pieces that won fame in the North African and Sicilian campaigns, the 155 millimeter "Long Tom" rifle and the howitzer of the same caliber. These weapons, of approximately six-inch caliber, are not being displaced; it is just that two huskier members of their family have arrived to back them up.

ENGRAVING BONDS — On the left you see the steel engraving plate being carefully polished by hand to remove the surplus ink while leaving it in the crevices. The worker at the right is placing on the inked plate the wet paper which will be war bonds after the printing is done. Eight bonds are printed on the one sheet.

The 240 millimeter howitzer throws a shell weighing about 350 pounds to an extreme range of 25,000 yards, or nearly 15 miles. Like all howitzers, it is intended to be fired at a moderately high angle, so that this crushing blow comes down on the enemy from above.

The eight-inch rifle, strictly speaking, is a 7.87 inch gun, for its caliber is officially given as 200 millimeters. Its shell weighs about 100 pounds less than that of the 240 millimeter howitzer, but it can hurl it much farther, to an extreme range of 35,000 yards, or more than 20 miles. Normally, however, it will not be used for such long, looping swings; advantage will be taken of its terrific muzzle velocity of 2,850 feet a second to drive upper-cuts straight at the face of enemy steel-and-concrete emplacements. This gun is as big as the main battery rifles of a heavy cruiser, and can hit with as much authority.

The really important thing about both these guns is that they travel on wheels, over ordinary roads, towed by heavy tractors. To lighten the load on bridges, each gun is separated into two parts for transportation in huge, pneumatic-tired carriers. It is thus possible now to send heavy ordnance, of calibers hitherto regarded as restricted to railway guns, into any fighting zone where wheeled vehicles can go at all.

So far as is known, the Germans have nothing that even approaches these two heavy weapons. Much was heard for a time of their 170 millimeter rifle in the Italian fighting. This, however, is only slightly heavier than our 165 millimeter "Long Tom."

It might be summed up as a good gun on a bad carriage—like a prize-fighter who can punch but has poor legs. Captured specimens of the German 170 have solid tires, like old-fashioned coal-trucks, so that it cannot possibly move at much more than a horse-trot speed. Our heavy pieces can move at any speed the towing vehicle can make. In a war where victory still goes to "the one that kin get there fustest with the mostest," that is a very important factor.

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TECHNOLOGY

War Bonds Made Carefully By Engraving Process

See Front Cover

➤ YOUR WAR BONDS are made as carefully as your cash. They are engraved, not printed. By the engraving process, ink is absorbed from the tiny crevices etched in a polished steel plate, while type printing is done by pressing the paper against the inked surface of type. Your paper money is engraved. The same presses are used for War Bonds. The flat steel plate is inked and wiped mechanically. Then the plate must be carefully polished by hand to remove all

traces of ink from the surface but to leave it in the etched crevices.

After this preparation, the plate is ready to print a sheet of eight War Bonds. The paper is wet when it is placed on the press; it is kept wet by the use of a humidor. The sheet passes under a well-padded roller which squeezes it into the engraved crevices of the plate causing it to soak up the ink.

The sheet of eight bonds is then removed from the plate and is placed between sheets of paper to dry. The engraved sheets are examined, and any defective bonds removed.

All the red printing that you see on your bond is next put on by one printing operation which is typographical.

Then the sheets are perforated and the edges trimmed, as shown on the cover of this SCIENCE NEWS LETTER. After this, they are assembled with record cards into small packets. The packets are bound into bundles which are piled on trucks ready for distribution to you.

These photographs by the Science Service staff photographer, Fremont Davis, were taken as the contribution of the SCIENCE NEWS LETTER to the Fifth War Loan Drive.

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IS YOUR BOND HERE? — The stacks of bundles on the right are all completed bonds ready to go out over the country in the Fifth War Loan drive. Buy as many as you want! On the left, you see the bonds getting the red printing put on them after the engraving printing process is completed. These photographs were made at the U. S. Bureau of Engraving and Printing.

GENERAL SCIENCE

United Action Asked

Professor Einstein urges brain workers to get together now to take thought and action towards proper organization of the peace.

BRAIN workers were urged to unite for common action by one of the most noted of their number, Prof. Albert Einstein, in a statement to the National Wartime Conference in New York.

Two principal needs demand such action by the brain-worker group as a whole, Prof. Einstein indicated: the necessity to protect their own economic interests and the urgent call right now to take thought and action towards the proper organization of the peace.

In a united effort towards the protection and betterment of their economic status, intellectuals might well take lessons from the working class, the eminent mathematician pointed out. Workingmen have done a good deal toward bettering their position in the community, whereas scientists and professional men remain less well protected against arbitrariness and exploitation than members of any other calling.

At the same time, Prof. Einstein continued, brain workers can learn from hand workers "what is our gravest danger, which we ourselves must seek to avoid: the weakening through inner dissensions, which, when things reach that point, make cooperation difficult and result in quarrels between the constituent groups."

In the promotion of the common good, united action by intellectuals will be most helpful, in Prof. Einstein's opinion, if it is applied vigorously in the fight for a supra-national political force as a protection against fresh wars of aggression. This does not necessarily imply commitment to any particular form or scheme, but rather calls for winning wider acceptance of the basic idea itself.

"It seems to me," he concluded, "that the working out of a view to selection of a particular plan for an international government should not, at the present moment, be our chief aim. For if there existed, among the majority of citizens, the firm intention of establishing international security, the technique of giving shape to such an instrument would not present an all-too-difficult problem. What is lacking in the majority is the conviction, founded on clear thinking, that there is no other means of permanently avoiding catastrophes like the present one. In the organization and promotion of enlightenment on this subject, I see the most important service which an organization of intellectual workers can perform at this historic moment."

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Girls of Ethiopia's Galla tribes not only eat *butter* but grease their braids of hair with it.

GENERAL SCIENCE

Science Program Over CBS Nation-Wide Radio

➤ "ADVENTURES in Science," a radio program over the Columbia Broadcasting Company's nation-wide network which in the past 13 years has presented over 700 leading scientists in person to the radio audience, is again on the air.

Each Saturday afternoon at 2:15 p.m. EWT, Watson Davis, director of Science Service, will conduct this program, bringing to the microphone guest speakers and presenting the current news of science.

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MEDICINE

War Blinded and Deafened Fewer Than Expected

➤ REASSURANCE to those worried about the number of men who will be blinded and deafened in this war and how they will be cared for appears in a report by Brig. Gen. Charles C. Hillman, U. S. Army (*Journal, American Medical Association,* June 3).

"Untrue," he declares, are all of the rumors "that many thousands of cases of deafness among servicemen may be anticipated as a result of this war, that every combat aviator may expect to suffer serious impairment of hearing, that there are thousands of war blinded and that a gigantic breeding program for dogs to guide blinded soldiers will be necessary to meet the demand."

The number of blinded registered with the Office of the Surgeon General was 73 as of the first of March this year, he reports. In addition, two blinded prisoners of war were under treatment.

Deafness has increased over that in World War I. On Feb. 12, 1944, the statistical division of the Surgeon General's Office predicted that the discharge rate for men with defective hearing will be about 34 per 100,000 annually, compared with 20 per 100,000 annually in World War I.

"Not as many cases have developed as might have been expected from the increased hazards in this war due to blast and noise," Gen. Hillman comments. "Persons with impaired hearing have not been received for rehabilitation from the Army Air Forces in greater proportion than from other branches of the service to date."

Many hard of hearing cases can, after adequate medical treatment, be trained in speech and lip reading, equipped in most cases with a hearing aid and returned to limited duty in the military service. The Army has designated three hospitals for special care of the deaf and two for special care of the blind.

Spiking further the rumors about a large breeding program for guide dogs, Gen. Hillman states that many blinded soldiers will develop the ability to get about with the minimum of assistance. Only about one-tenth of the blind can use dogs to advantage, experience has shown, and the Army Medical Department and the Veterans Administration believe that a veteran should secure a guide dog only when it is shown that this is the best solution to his problem.

Private guide dog agencies have agreed, he states, to provide dogs to blinded soldiers either gratis or at nominal cost. These agencies will be able to furnish all the dogs that are likely to be needed and government aid in supplying dogs will not be required.

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INVENTION

De Luxe Amphibian Car Has Retractable Wheels

➤ A DE LUXE "duck" is the invention put forward by four Buffalo inventors, R. W. Hofheins, Carlos E. Harrington, C. D. Thomas, and Paul P. M. Dubosclard, for patent 2,350,037. Their amphibian car has a water-tight body, with propeller and rudder aft, for use on water, and has either two- or four-wheel drive when operating on land. A special feature is an arrangement for retracting the wheels when in the water, to give the hull a better "ship shape" and interpose less drag in navigating. The inventors have assigned rights to their patent to the Amphibian Car Corporation of Buffalo.

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INVENTION

Grain Cars May Have New "Roll-Top" Doors

➤ FOR GETTING farm products to market, M. I. Beaudine of Abercrombie, N. Dak., has invented an improved grain car door, on which he has been granted patent 2,349,934. It is built on the general principle of the roll top of an old-fashioned office desk, and slides up under the car roof when it is opened. It may be opened and closed from the outside of the car.

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IN SCIEN

PUBLIC HEALTH

New Contagious Disease Discovered in Children

➤ A NEW CONTAGIOUS disease with symptoms so mild the sickness may go unnoticed is reported by Dr. Carl H. Smith, of Cornell University Medical College and the New York Hospital (*Journal, American Medical Association,* June 3).

The chief feature of the disease is an increase in the lymphocytes, one of the kinds of white cells in the blood. Although the number of white cells may be increased almost ten-fold, the lymphocytes are not abnormal or atypical.

Fever and vomiting, pain in the back of the head and neck, or pain in the abdomen suggestive of appendicitis may occur in this new disease, but when they do, these symptoms last only a few days. In one case Dr. Smith reports, the child had fever, vomiting and abdominal pain, but a brother and sister had only symptoms of a mild cold.

Only since 1939 have cases of this disease, called acute infectious lymphocytosis, been reported. The cause has not been identified but is believed to be a virus. The disease apparently attacks young children chiefly and they all seem to recover.

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ENGINEERING

Separate Cylinder For Engine Compression Stroke

➤ A RADICAL departure in internal combustion engine design is embodied in an invention by Henri L. Javal of Vichy, France. Compression of the fuel mixture in the cylinder, in the conventional four-cycle engine, is admittedly wasteful of power. M. Javal proposes to accomplish compression much more efficiently by providing each working cylinder with a separate compression cylinder alongside it, so geared and valved that the charge of compressed fuel mixture will be delivered for ignition at the right instant of the working stroke.

As is the case with all patents issued to citizens of enemy-dominated lands, this patent, No. 2,349,967, is vested in the Alien Property Custodian.

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E FIELDS

ASTRONOMY

Faint Comet Discovered In South Africa

➤ A COMET has been discovered by D. du Toit at Harvard Observatory's southern station at Bloemfontein, South Africa, according to a cablegram received from Dr. J. S. Paraskevopoulos, superintendent of the southern station. When discovered on May 16, the comet was of about the tenth magnitude and therefore much too faint to be seen without a telescope.

The comet was found near the southern constellation Pavo, the peacock. On May 25 its right ascension was 21 hours, 1 minute, and its declination 63 degrees, 44 minutes south. At that time its daily motion was 9 minutes east and 14 minutes south.

Mr. du Toit, young member of the Bloemfontein staff, is also credited with having discovered a comet in the summer of 1941. This comet, however, was independently spotted a few days later by Astronomer Neujmin at Simeis Observatory in the Soviet's Crimea.

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CHEMISTRY

Synthetic Alcohol Produced From Coal and Water

➤ SYNTHETIC production of alcohol, light fuel gases and formaldehyde out of water-gas produced from coal, wood or other source of carbon is claimed for apparatus devised by an Australian inventor, Paul Xavier Spillane of Ashfield, N.S.W., who has just been granted U. S. patent 2,349,915. Distinguishing his process from others undertaking the same end is the use of an ultra-high-frequency electrical field, of from 60,000 to 100,000 volts at between 6,000,000 and 37,000,000 cycles per second, in addition to the high temperatures and pressures customarily employed in organic syntheses in the presence of catalysts.

The carbonaceous raw material is first subjected to destructive distillation, and the gases driven off are burned to produce power in the plant. The hot carbonized residue is then treated with steam to produce the mixture of hydrogen and carbon monoxide known as water gas. Proportions of the two gases are adjusted according to the product desired. Working pressures also vary, each product having its optimum. For methanol (wood alcohol) for example, the pressure is raised to as much as 250 atmospheres, or 3750 pounds per square inch.

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ENGINEERING

"Water Spider" Boat Has Legs, Propeller, Wings

➤ A WEIRD water craft, that looks like something that Orson Welles might have dreamed up but is claimed to be of real military value, is the offering of two Los Angeles inventors, V. B. Moore and S. P. Tsoneff, assignors to the American Marine Engineering Corporation. The patent number is 2,347,985. It seems to have received its inspiration from those odd, long-legged predatory insects that skim about on most quiet water surfaces, known as water-striders.

The water spider has a body (hull or fuselage, as you may prefer) with an airplane propeller and stubby wings. The latter are not intended to lift it into flight, but only to balance it. It stands, with hinged and braced legs, on four small hulls that rest on the water surface. The idea appears to be for the strange craft to skim the surface at high speed, while its operators, well above spray and local wave disturbances, can carry out their military mission.

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INVENTION

Process Dehydrates Kelp For Use as Cattle Feed

➤ IN THIS WAR as in World War I, the giant kelps or seaweeds of the Pacific coast are attracting considerable attention. One use to which they are being put is in cattle feed, to which they contribute valuable minerals, iodine and certain vitamins. Dried in the sun on the beach like hay in the hayfield, however, they lose much of their vitamin content.

For this reason four California inventors, D. E. Clark, L. D. Pratt and S. A. Coleman of San Diego and H. C. Green of El Cajon, have invented a two-stage kelp drier, on which they have received patent 2,350,209. In the first stage, the chopped kelp, still exceedingly wet and pulpy, is put through a rotary drier. From this it is discharged onto a conveyor through which a current of hot air is blown, completing the drying process.

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ENGINEERING

New Quick-Assembly Bridge Now in Use Under Fire

➤ THE BAILEY bridge, most successful quick-assembly spanning bridge now in use under fire, will speed the movement of United States and British Armies into Europe.

Already in use on the Fifth and Eighth Army fronts in Italy, the Bailey bridge is now standard U. S. Army equipment.

The bridge is made up of a series of prefabricated metal panels, which can be put together very rapidly and flung over a river or chasm to support the heaviest artillery, armor, and transport.

Further details of the bridge, especially those regarding its fast assembly, are still secret.

Named after its inventor, Donald C. Bailey, British civil engineer and adviser to the Royal Engineers, the bridge has been described by Gen. Bernard Montgomery at "the best thing in that line we have ever had. It will be needed wherever we operate in Europe."

Science News Letter, June 10, 1944

MEDICINE

Malnutrition May Cause Pain After Tooth Pulling

➤ PAIN and the dry socket condition that plague patients and dentists after a tooth has been pulled are often due to the patient's being undernourished and below par physically, Dr. Vernor H. Eman, dental surgeon of Grand Rapids, Mich., reports in the Journal of Oral Surgery, published by the American Dental Association.

"The majority of patients for extraction are taken, we might say, literally 'off the street,'" Dr. Eman states. "They come in because they have a toothache or because, for some reason or other, and possibly without the advice of a physician, they have decided that certain teeth should be removed. A satisfactory and complete evaluation of the patient's physical condition is, under such circumstances, hardly possible.

"An undernourished patient is a poor risk for any operation, and that applies quite as definitely to minor as to major surgery. Undernourishment may be present, of course, for reasons other than deficiencies of diet, but the most impressive of all cases have been the dietary deficiency cases."

Science News Letter, June 10, 1944

CHEMISTRY

Man-Made Quinine

For the first time in history, this precious drug has been produced without the aid of a tree. With malaria spreading, this discovery is timely.

By HARLAND MANCHESTER

➤ EIGHTY-EIGHT YEARS ago a young man named William Perkin spent his Easter vacation in his attic laboratory in London trying to duplicate in a test-tube the quinine that comes from tree-bark. Malaria was ravaging the world, as it is today, and as usual there was a shortage of quinine. Before his vacation was over, the 18-year-old Perkin had discovered the first coal-tar dye. Thus he founded the organic chemical industry, and he became Sir William, but he never did synthesize quinine. That remained a kind of Holy Grail for aspiring chemists.

So it remained until Easter this year, when two young men named Robert W. Woodward and William E. Doering also spent their vacations in a laboratory, and finally succeeded where Perkin and many other brilliant scientists had failed. Starting with chemicals which can be made either from coal or petroleum, they copied the complicated structure of the quinine molecule and emerged with a small vial of the precious drug. It is not a substitute or an approximation; it *is* quinine, produced for the first time in history without the aid of a tree.

Very Timely

No discovery was ever more timely. Even before the war, the world malaria total ran to 800,000,000 cases and 3,000,000 deaths a year, and the cost of malaria to the United States alone was set at half a billion dollars annually. Despite the best medical care in the history of warfare, malaria is spreading, and health experts warn that because of great war migrations and faster transportation it may again menace areas where it was once under control. The cinchona groves of Java, which produce nearly all the world's quinine, are in the hands of the enemy, and our stockpile cannot last forever. The program for repatriating the cinchona tree in the Western Hemisphere will take many years, and, despite the use of atabrine and other substitutes, it is widely held that nothing can take the place of quinine itself. Few discoveries in the history of medicine offer greater potential promise than the tiny mound of crystals which materialized last April in Cambridge, Massachusetts.

Everyone connected with the Cambridge achievement is young. Robert Woodward and William Doering, who did the job, are 27 and 26. Edwin H. Land, scientist and manufacturer who backed the project, is 35.

Polarized Light

The story really begins ten years ago, when Land invented a way of aligning crystals of quinine and iodine in a transparent plastic sheet. This cheap material polarized light just as efficiently as the scarce and enormously expensive calcite crystals theretofore used. Land founded the Polaroid Corporation, and his sheets found an amazing variety of uses, from sun glasses to naval instruments. Soon he became one of the largest non-medical users of quinine in the country.

As early as 1931, when the Japanese invaded Manchuria, Land saw that our supply of quinine was threatened. He began experimenting with new light polarizers in which the crystals from cinchona bark would not be needed. The possibility of synthesizing quinine was of course discussed, but the success of such a project depended upon finding a chemist with a brain like Pasteur's or Ehrlich's, so this solution was dismissed. Finally a substitute polarizer was found which was even better than the quinine-crystal sheet.

But Land did not lose interest in quinine. Research plays an all-important part in his business, and he keeps on his payroll a number of part-time consulting chemists who teach or study at neighboring colleges. If one of these men has a pet project which looks promising to Land, he sometimes tells him to go ahead with it on the company time, even if the project doesn't look like an immediate money-maker. One such consultant was Dr. Woodward, who teaches at Harvard and who played a part in making the new quinine-less polarizer. Woodward couldn't get synthetic quinine out of his mind.

"I believe quinine can be synthesized," he told Land calmly, "and I believe that I can do it."

Woodward is a slender, bespectacled Boston-intellectual sort, the last man on earth to brag. He speaks mildly, but his words reveal a tough self-confidence, and people believe what he says. Land believed him, and in view of the record he had plenty of reason. Woodward was a ball of fire at the Massachusetts Institute of Technology, where teachers not given to fulsome praise called him "first in a class of one." Since knee-pants days he had worked in his home laboratory. After a year at M.I.T., where he did chores to defray his expenses, he was given a fellowship and his own laboratory to work in, and soon he was told to forget about classes and go on as he pleased. After four years' work he became a Ph.D. at the age of 20—a thing previously unheard of at M.I.T. After that he did further work at Harvard, and then joined the faculty.

"Road Map"

Encouraged by Land, Woodward prepared a brief plan for one of the most difficult and elaborate jobs in the history of chemistry. "It was a kind of road map in ten pages," says Land, "which charted a likely course through a long stretch of unknown terrain. He knew he might have to detour around swamps or mountains, so to speak, but he had a clear sense of direction, and anyone who knew Woodward would believe that he had a good chance of getting through. So I told him to go ahead."

One thing Woodward insisted upon. Bill Doering, a friend of his at Harvard, had to help him. Put Doering in a laboratory and he thinks the way Woodward does, but there the similarity ends. He was born in Texas, is full of bounce and ginger. He is openly delighted at the victory of his team, and dramatizes a diagram of the quinine molecule as though he were presenting Rita Hayworth. He is a natural complement to his reserved, matter-of-fact partner.

The two men set to work on Febru-

ary 1, 1943. Before them was a wooden model of the fantastically complicated quinine molecule which they were determined to duplicate. Fify-two balls, variously colored to represent the atoms of carbon, hydrogen, nitrogen and oxygen which make up the molecule, were joined in a crazy, asymmetrical pattern by means of short sticks. This two-foot model is a 150-million-times magnification of what scientists believe the quinine molecule resembles, judging by its behavior in various tests. If you alter the position of a single one of those 52 little spheres, you no longer have quinine.

Started from Toluol

Woodward and Doering started with a chemical called 7-hydroxyiso-quinoline, which comes easier after you say it three times. This chemical is obtained from toluol (basis of TNT) and acetylene, both of which can be derived from coal or petroleum. It is composed of the same types of atomic building blocks as quinine, but its molecule is radically different from the quinine molecule. The task facing Woodward and Doering was to take this molecule and figuratively juggle the balls and sticks around until they had precisely duplicated the pattern of the quinine molecule.

To the layman, this is like trying to build a four-masted schooner in a bottle in the dark. Perkin had tried to do the job by simply adding and subtracting atoms until he had the right number of each kind, hoping that in some way they would arrange themselves correctly. He might as well have thrown a galley of type from his attic window in the fond hope that it would set iself up into a telephone book when it hit the street.

Two Parts

Following Woodward's "road map," the two men first imagined that they had carved the quinine molecule into two parts, then set out to duplicate each part separately. Months were spent in erecting what Doering calls a chemical "skeleton" of the molecule, to which the details could be added later by means of infinitely patient carpentering jobs. Woodward teaches organic chemistry at Harvard, and could work only part time on the project, but Doering had just finished a secret war assignment and was free to experiment day and night. They were greatly relieved when summer vacation came, for then they could really get to work.

Starting with five pounds of the stuff with the long name, they put it through 15 major processes. They tortured it in stills under high pressures and temperatures to force new atoms into it, and after each step they had to put it through a new process to rescue the stuff that had "jelled" as it should, and get rid of the residue. In October, Doering took a teaching job at Columbia, and the partners had to collaborate at long distance, getting together weekends whenever possible to talk things over.

They were near the end of the road last March when they got a shock that nearly sank them. They finished the "prefabricated" sections of their quinine molecule, and sent one section to an outside laboratory for a test before trying to join the sections. In the wooden model, some of the atoms are connected by two parallel rods, and unless these "double bonds" are in exactly the right place, what you have is not quinine. When the result of the test came in, it showed that one double bond was in the wrong place.

Mistake Made

"We were ready to pack up and go home," says Doering. "But we couldn't see how we had slipped, and asked them to try again. We could hardly eat or sleep while we waited for the result. Well, the laboratory found that a mistake had been made in the testing method. They did another test, and we were right. That double bond was exactly where it should be."

Their work was saved, but they were nervously shot to pieces. Woodward phoned Doering at Columbia.

"Do you think you can finish it?" he asked.

"Do you think *you* can finish it?" countered Doering.

They were within sprinting distance of the tape, but neither had the strength to go on alone. Then Easter vacation arrived, Doering joined Woodward in Cambridge, and together they entered the last lap. They had a sort of now-or-never feeling about the venture, and drove themselves without mercy in a race with the flying days of "vacation."

Their records show that during nine days they worked a total of 110 hours, and that for six days in a row they stuck to the job until 2 a.m.

They knew that once they obtained quinotoxine, a close *(Turn to page 380)*

Do You Know?

Sulfathiazole, used in the treatment of inflammation of the tonsils, is now put up in chewing gum form.

The Mexican *huaraches,* a sandal-type footwear with a leather or woven henequen sole, are generally worn in rural districts and have distinctive designs which indicate the home section of the wearer.

Our 1943 *alloy steel* production alone was as great as Japan's total steel-making capacity.

During 1943 the United States shipped under *lend-lease* 11% of its lamb and mutton and over 15% of its pork supply.

A new *mulberry tree* has been developed for rearing silk worms in Latin America which produces a crop of leaves in six months.

Possible production of concentrated *superphosphates* for fertilizers without the use of sulfuric acid, by a method which employs phosphoric acid, is under investigation in Eire's emergency scientific bureau.

Milk requirements of the military services are nearly 50% larger than in 1943.

There is enough *aluminum* in the JRM-1, largest of the world's cargo planes, to make 100,000 saucepans.

Two-thirds of the nation's *traffic* is moved by railroad.

Helium is used in the treatment of asthma, tuberculosis, and other respiratory diseases.

Sugar goes into bombs, hand grenades and plastics—via industrial alcohol.

A new material for *luggage* is blotting paper impregnated with synthetic rubber to add toughness.

Estimates of the number of different kinds of *insects* in the world range from 600,000 upward.

Wheat is older than the history of man.

From Page 379

relative of quinine, they could coast home, for back in 1853 Louis Pasteur had converted natural quinine into this material, and later, Rabe had changed it back to quinine. Late one night on the last day of vacation the stuff they had battered away at for more than a year turned to a dirty brown oil. This was a mixture of two kinds of quinotoxine, one of which yields quinine. Separating the two was a tricky job. After long preparation, they tried an acid used by Pasteur in dealing with a closely related substance. Nothing happened, and there was another agonizing moment.

Shot in the Dark

Then, by some sort of chemical intuition, they tried a shot in the dark, using a different acid. It worked, and a beautiful spectacle slowly took shape—fine yellow, interlaced needles of the quinine-yielding quinotoxine, the first ever made by man. Quinine itself was now in the bag, since they had only to follow in the footsteps of Rabe.

The next morning there were a few loose ends to pick up, and finally, after 14 months and ten days of concentrated work, the job was done. For the information of future engravers, the hour was 11 a.m., and the date Monday, April 10, 1944. It was, incidentally, Bob Woodward's 27th birthday.

Although Woodward and Doering have made a chemical discovery of the first magnitude, they are quick to point out that if the quinine they have constructed is to be made in quantities for medical use, the work has just begun. It is all very well to say that quinine can now be made from coal tar, and coal tar is cheap, but that proves nothing to a chemist. Woodward cautiously speaks of the loss of material along the way as they followed his tortuous "road map." Starting with five pounds of chemical, they obtained the equivalent of 40 milligrams of quinine, which is about a twelfth of a dose. The cost of quinine as produced by the two men in the laboratory would run to many thousands of dollars per dose.

Business of Engineers

But it is the business of chemical engineers, not research men, to take these discoveries and find ways of translating costly laboratory methods into large-scale production plans. Chemical engineers are optimistic these days, and with reason. They took 100-octane gasoline which cost a thousand dollars a gallon in the laboratory, and found ways of making it in vast quantities, and cheaply. They are the men who took the new vitamins and a dozen other drugs and found ways to make them cheaply in bulk.

The trail which the Polaroid men blazed is rocky and winding, but already there are indications that further work may smooth it down and provide short-cuts. For instance, the quinotoxine which they found at the end of the road is a mixture of two varieties, one of which had to be thrown away to make quinine identical with the natural product. The discarded molecule is a "left-handed isomer" of the other, that is, it looks like a mirror reflection of the one which is used, and it does not exist in nature. Plans are under way to test this new molecule on malarial birds and monkeys, and it may turn out to be just as good, or better, than the right-handed one which yields real quinine. If it does, there will be no need to separate the two. This would not only simplify the process, but would more than triple the yield. Cost, of course, would be correspondingly cut.

Another Scarce Drug

After they had reached their goal, Woodward and Doering suddenly realized the importance of the fact that they had also produced quinidine—a drug important in the treatment of heart ailments—which is now so scarce that not even the armed services have enough of it, and its civilian use is rationed on a strictly life-or-death basis. Quinidine is now derived from natural quinine by a slow and expensive process. If the Woodward-Doering discovery is successfully put into commercial production, synthetic quinidine may turn out to be of even greater wartime value than man-made quinine itself.

There are other exciting possibilities. A number of related drugs of unknown medical value were created in the process of constructing the quinine molecule. Nobody knows what these young men have started in addition to creating quinine.

Since that morning when the weary partners capped their long grind with a "Q.E.D.," government agencies and drug-manufacturing firms have been in a turmoil of investigation and plan-making. The Polaroid Corporation, which instigated the work and paid for

it, owns the new process, but President Land and everyone connected with the discovery is aware of the obvious fact that it must be developed in the public interest. The world has learned its lesson in allowing the Dutch quinine monopoly to control the price and production of a drug desperately needed by hundreds of millions of people. Land proposes to give non-exclusive licenses to whatever pharmaceutical firms are indicated by government authorities, and to use the income from these licenses to back further ventures in general research.

Meanwhile Woodward and Doering are plotting routes for further prospecting trips in atomic regions where man has never trod. Only scientists know the hazards they will face. They and their fellow chemists are a bit irritated at the question people have been asking, "Why wasn't quinine synthesized before?"

"Well, why wasn't it?" I asked, to see what would happen.

"It's like this," one chemist explained with weary patience. "There are 52 atoms in the quinine molecule, and there are 52 cards in a deck. Everybody uses the same kind of deck; why can't everybody win at cards?"

Doering made it shorter.

"Because no one ever came along as smart as Bob Woodward," he said.

This background story on the synthesis of quinine will appear in Reader's Digest for July. See SNL May 13 for earlier story and photograph.

Science News Letter, June 10, 1944

GETS THERE—This little plane can land on a small clearing in the jungle, or on a small landing strip along a road, to pick up a man wounded in combat. In this U. S. Army Air Forces photograph it is shown being pushed back out of the enemy's sight until it is ready to take off again.

CHEMISTRY

OEI Governs Molecules

Structure of giant synthetic rubber molecules is controlled by action of a new chemical agent. Makes possible uniform quality.

➤ A NEW CHEMICAL AGENT, extracted from a natural vegetable oil, controls the growth and structure of giant molecules which, in turn, determine the properties of finished synthetic rubber.

Facts about the chemical agent, developed by the United States Rubber Company, show that its use assures a standardized mixture of synthetic rubber at all times and permits the manufacture of completed tires, tubes, and other articles of war of known uniform quality.

Added to a mixture of butadiene and styrene, essential ingredients in the manufacture of GR-S synthetic rubber, this chemical agent controls the length of the molecular chains that determine the elasticity and strength of the product.

Too much of the chemical agent added to the mixture keeps the molecules too small, thereby producing a rubber that is soupy and of no practical use. Too little added to the mixture allows the molecules to become too large, making the rubber too stiff. Proper amounts of the chemical agent added to the mixture produces chains of molecules of optimum size and length, and the resulting rubber is of the desired consistency.

The exact chemical composition of the new chemical agent is one of the big secrets of the wartime synthetic rubber program. In speaking of it, chemists refer to it as O E I, "One Essential Ingredient," or by other specially coined terms.

The OEI chemical agent is being used today in practically all manufacture of Buna S synthetics. In order to meet the increasing demand for it by rubber producers, five major industrial chemical companies are manufacturing and experimenting with the chemical agent and substitutes.

Science News Letter, June 10, 1944

AERONAUTICS-MEDICINE

Grasshopper Planes Used To Evacuate Wounded

➤ THE TINY grasshopper planes, or flying jeeps, are being used by the Army in the jungles of Burma for air ambulance work.

Up to the present time these planes

have been used mainly for reconnaissance work and directing artillery fire. This is the first time that they have been used as flying ambulances.

Because of their steep climb, low landing speed, and ability to land and take off after a run of only 65 yards, they can operate in and out of small jungle clearings where larger airplanes cannot possibly go.

They will save many hours in time required to move wounded soldiers from highly inaccessible places. Wounded been flown back to base hospitals in 45 minutes, a trip that would take litter bearers 10 hours.

Converted to ambulance work, each grasshopper will carry one standard stretcher. Probably the smallest warplane in use, it has a wing span of only 34 feet, a length of 24 feet, and is powered by a 185 horsepower engine.

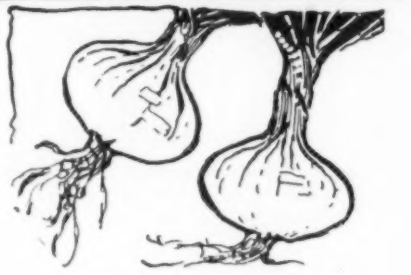
Military surgeons, in praising the new use for tiny aircraft, stated that many seriously wounded soldiers, abdominal cases in particular, can be saved if operated on within the "golden period"—that precious four hours immediately after injury, before infections develop.

Science News Letter, June 10, 1944

Approximately 200,000 women are now employed in all branches of domestic *transportation*—rail, water, air, motor, street car and pipe line—or about 8% of the total employment in the field.

GENETICS

NATURE RAMBLINGS
by Frank Thone



Better Onions Coming

➤ ONIONS in tomorrow's market-basket will be bigger and better as a result of a new method for producing hybrid varieties developed by two U. S. Department of Agriculture scientists, Dr. Henry A. Jones and Dr. Alfred E. Clarke. The two men have just been voted the Vaughan Research Award of $500 for a paper describing their procedure, which was published in the *Proceedings of the American Society for Horticultural Sciences.*

Hybrid plants of any kind are very likely to be bigger and more vigorous than either of the parent varieties. This has been well demonstrated in hybrid corn. Hybrid onions, therefore, were considered a most desirable kind of vegetable to try for.

To produce a hybrid plant, the pollen of one variety is placed on the pistil, or seed-producing part, of a different kind of plant. To make sure that fertilization with the female parent's own pollen does not occur, the pollen-producing organs, or stamens, must first be removed.

This is easy to do in a cornfield, for the stamens are in the tassel at the top of the stalk, well away from the silks on the ears, which receive the pollen and help complete ferilization. All the grower needs to do is go along the rows, pulling the tassels off the stalks that are to be the female parents of his hybrid corn.

This situation, however, is quite exceptional. In most plants, stamens and pistils are produced close together in the same flower, so that preventing self-pollination is a tedious job requiring fine-pointed tweezers. On a field scale this is obviously impracticable.

By close watching, Dr. Jones and Dr. Clarke discovered a strain of onions in which nature had obligingly done the job without prompting: the female parts of the flower were capable of producing seed, but the stamens contained no fertile pollen. Fertilizing these exclusively female flowers with pollen from different varieties of onion, it is possible to produce hybrids with any combination of qualities desired, and at the same time receive the advantage of the extra vigor and size that goes with hybrid growth.

Keeping the female parent strain going presents no particular difficulty. Like many varieties of onion, it produces bud-like bulbils, or "top sets," and since these are not sexually produced they carry only the hereditary characters of the plants on which they grow.

Market gardeners raising hybrid onions are not expected to grow their own seed. This will be a specialists' job, as the production of hybrid seed corn is at present.

Science News Letter, June 10, 1944

Extra *red corpuscles* are developed by persons living at high altitudes to take care of oxygen needs.

Carrot-corn *ensilage* recently tested on milk cows at the Ohio Agricultural Experiment Station proved palatable, gave good returns in milk, and a small favorable effect on the yellow color of the butterfat produced.

• First Glances at New Books •

➤ WARTIME EXPERIENCES have shown that sound navigators can be trained without extensive theoretical background in mathematics and astronomy. Trigonometry is almost entirely avoided and other technical terms and definitions kept to a minimum in BASIC MARINE NAVIGATION by Dr. Bart J. Bok and Frances W. Wright (*Houghton Mifflin*, $4.50). Dedicated to the navigators of the U. S. Army's Engineer Amphibian Command, this readable book is designed for those who study navigation with the intention of practicing it. Accompanied by a kit of practice materials (*Houghton Mifflin*, $1.70), which contains charts, diagrams and a course protractor, the book and kit together provide a complete outfit for a self-taught course in navigation.

Science News Letter, June 10, 1944

➤ MIDDLE AMERICA, by Charles Morrow Wilson (*Norton*, $3.50), is an interesting geographical narrative of Mexico, Central America, Cuba, Haiti and the Dominican Republic. The ten countries included are the nearest Latin-American neighbors of the United States. Their people, resources, and strategic value are described. It is a timely book in our good-neighbor policy.

Science News Letter, June 10, 1944

➤ TALK ABOUT WILDLIFE (*Author* $1.75) sets forth clearly and with emphasis the views of an experienced field zoologist, Ross O. Stevens, about the current situation in wildlife conservation and administration, and what may be done to make it better.

Science News Letter, June 10, 1944

Just Off the Press

BASIC MARINE NAVIGATION—Bart J. Bok and Frances W. Wright — *Houghton Mifflin*—422 p., illus., diag. Book $4.50, Kit $1.70.

CLOTHING AND SHELTER FOR EUROPEAN RELIEF—*National Planning Association*—47 p., tables, paper 25c. Planning pamphlets No. 34.

HACKH'S CHEMICAL DICTIONARY (American and British Usage) 3rd. ed., rev.—Julius Grant, ed.—*Blakiston*, 925 p. illus., $12. A standard reference book based on recent chemical literature with numerous tables, diagrams, etc., and containing the words generally used in chemistry and many of the terms used in the related sciences.

HOMICIDE INVESTIGATION, Practical Information for Coroners, Police Officers, and Other Investigators—LeMoyne Snyder—*Charles C. Thomas*, 287 p., illus., $5.

LIVING WITH CHILDREN — Gertrude E. Chittenden — *Macmillan*, 163 p., illus., $1.75. A textbook on child development intended also for parents. The author is professor of child development at Iowa State College.

MAKE AND REMODEL HOME FURNISHINGS —Ruth Wyeth Spears—*Barrows*, 192 p. illus, $2. New ways to keep your home attractive.

MAKING A DRESS AT HOME — Margaret Smith—*Gov't Printing Office*—24 p. illus. 10c. U. S. Department of Agriculture Farmers' Bulletin No. 1954.

ORGANIZATION, DIRECTION, AND SUPPORT OF RESEARCH, A Symposium—Proceedings of *American Philosophical Society*, vol. 87, number 4, 73 p., paper, 75c.

PAPERS ON ARCHAEOLOGY, ECOLOGY, ETHNOLOGY, HISTORY, PALEONTOLOGY, PHYSICS AND PHYSIOLOGY—Proceedings of the *American Philosophical Society* vol. 87, number 5—95 p. illus., paper, $1.

THE PHYSICAL CHEMISTRY OF ELECTROLYTIC SOLUTIONS—Herbert S. Harned and Benton B. Owen—*Reinhold*, 611 p., diag., $10. American Chemical Society Monograph Series.

PRINCIPLES OF POWDER METALLURGY—Franz Skaupy—*Phil. Library*, 80 p., illus., $3. Translated by Marion Lee Taylor.

A SOURCE BOOK OF AGRICULTURAL CHEMISTRY — Charles A Browne — *Chronica Botanica Co.*, New York City, *G. E. Stechert and Co.*—290 p. illus., paper, $5. Chronica Botanica, Vol. 8, Number 1.

A WAR ATLAS FOR AMERICANS, A guide to the nature and course of the war—Office of War Information—*Simon and Shuster* —86 p., maps, paper, $1., bound ed. $2.50.

Science News Letter, June 10, 1944

MEDICINE

Better Influenza Vaccine

Auxiliary substances such as oil containing dead tuberculosis germs may make vaccine much more powerful and longer lasting.

➤ DEVELOPMENT of a more powerful vaccine against influenza with longer lasting effect may come as a result of research reported by Dr. William F. Friedewald, of the Rockefeller Foundation's International Health Division Laboratories. (*Science*, June 2)

Dr. Friedewald has already developed a vaccine that increases influenza resistance in mice about 1,000 times over the resistance conferred by a previous influenza vaccine. With the new vaccine the resistance lasts 26 weeks, which it does not with the ordinary vaccine. Rabbits and ferrets also gained increased resistance with the new vaccine, as indicated by blood tests.

The increased potency of the vaccine comes from adjuvants, or auxiliary substances, such as paraffin oil containing dead tuberculosis germs, an absorption base known as Falba, and another microorganism, Mycobacterium butyricum, which is a relative of the TB germ.

These auxiliary substances probably could not be safely used in human influenza vaccines, Dr. Friedewald points out, but further study of the phenomenon may provide materials which could safely be used.

The idea of using these auxiliary substances to enhance the protective capacity of influenza vaccine came from research by Dr. Jules Freund and Dr. K. McDermott, of New York. They found they could make the bodies of laboratory animals produce more antibodies to fight invasions of disease germs or foreign proteins such as horse serum by adding adjuvants to the vaccines or horse serum.

Science News Letter, June 10, 1944

•New Machines and Gadgets•

❁ *RATION STAMP cutter will clip coupons or stamps from the ration books and store them for future counting. The sheet of stamps is slipped into place in this newly patented device, and a rectangular cutting plunger pushed downward by hand. The cutter separates a stamp and pushes it into a box below.*

Science News Letter, June 10, 1944

❁ *WHEELBARROW with a low supporting platform in front of the carrying wheel, recently patented, may be used to pick up and carry barrels, boxes, rocks and other heavy objects. The front edge of the platform may be tilted to meet the ground.*

Science News Letter, June 10, 1944

❁ *SUPPORT for a garden hose, newly patented, resembles a three-legged carpenter's horse. The spreading front legs hold it upright and grasp the nozzle end of the hose. The single leg is pivoted and can be swung to lower the back end of the horse and change the angle of the hose with the ground.*

Science News Letter, June 10, 1944

❁ *WHISTLING nozzle for gasoline delivery hose, attachable to the ordinary nozzle, whistles when the tank is nearly full. The device, newly patented, has two air intakes, one on the lower end and one on the side. When the liquid closes the lower, air entering the other impinges on a lip and causes the sound.*

Science News Letter, June 10, 1944

❁ *BOMBS weighing two tons, destined for Nazi warplants, are eight feet in length and nine feet in circumference, as shown in the picture. Parts are fitted, and then arc welded by a technique that requires only eight hours of welding time. They are leak-proof.*

Science News Letter, June 10, 1944

❁ *GLASS-ASBESTOS fibers are used to make an inorganic canvas or duck textile for application in airplanes or other places where high strength, light weight, and high resistance to abrasion, high temperatures and corrosive fumes are essential. To make the material, either glass and asbestos yarn are woven together, or glass and asbestos fibers are combined to form yarns.*

Science News Letter, June 10, 1944

❁ *FACIAL CLEANSER with vacuum action, recently patented, consists of a palm-size metal or plastic ring containing a sponge. The ring is capped with a flattish cup forming an air pocket between it and the sponge. Increasing and decreasing pressure on the cup produces the vacuum action on the skin which, it is claimed, helps remove dirt and other particles.*

Science News Letter, June 10, 1944

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N St., N. W., Washington 6, D. C., and ask for Gadget Bulletin 211.

Question Box

CHEMISTRY

How can alcohol be made from coal and water? p. 377.

What is the story behind the synthesis of quinine? p. 378.

GENERAL SCIENCE

Why should brain workers organize? p. 375.

GEOPHYSICS

What new instrument makes it easy for a surveyor to find out just where he is? p. 371.

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